THE WARBLER

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Dear Student, Artist, Thinker,

I'm particularly excited to write this week's introductory letter because it's about one of my favorite subjects, **science in Alabama**. The reason why I personally take so much interest in this subject is not just because I am from Alabama myself, but also because Alabama is a beautiful place to study the intersections between science and history.

One example of this would be George Washington Carver. He was one of the most renowned African American scientists whose name has become common in many households and who was innovative in agricultural sciences. This, despite the racism that African American people experienced during his life. He invented hundreds of products, including over 300 from peanuts and 118 from sweet potatoes. He invented crop rotation, which allows humans to use the same plot of land annually to grow crops without depleting the natural resources in the soil that the plant needs. He also had a bio-fuel vision, one which has become a consideration in the movement for a more sustainable infrastructure in today's society.

Another scientist is Mae Jemison. She was the first Black woman astronaut, a physicist, and even physician who logged 190 hours in Earth's orbit. She also served on the World Sickle Cell Foundation and led a consulting firm that examined the sociocultural impacts of technology. Recently, Huntsville was a hub for the construction of the James Webb telescope, which will allow us to see into the distant past. Physicists theorize that the farther in space we are able to see, the farther back in time we will be able to see. It is believed that the telescope will allow us to see down to 100 million years after the Big Bang and provide a view of the formation of galaxies and stars.

Along the same lines, Alabama also provides a glimpse into the Earth's natural history, and it is a particularly special place because of its geological and biological diversity. Alabama has more than 4,500 documented species, and it's known by scientists for its fossil records. It holds one of the best hospitals in the nation that's renowned for its rheumatology (chronic pain), nephrology (kidneys), pulmonology (lungs), and cardiology (heart), departments. I am very enthusiastic about this subject, and I hope that this edition of *The Warbler* will show you why. Enjoy!

Cheers!

Taylor and the APAEP Team

"The really wonderful thing that happened to me when I was in space was this feeling of belonging to the entire universe."

DR. MAE C. JEMISON // American doctor and NASA astronaut

WORDS INSIDE

FROM "THE JAMES WEBB SPACE TELESCOPE ..."

French Guiana | An overseas department of France on the northeast coast of South America composed mainly of tropical rainforests

exoplanets | A planet outside the solar system

infrared | Having an electromagnetic wavelength greater than that of the red end of the visible light spectrum but less than that of a microwave. Infrared is emitted particularly by heated objects

FROM "ALABAMA PALEONTOLOGIST HELPS DISCOVER ..."

genus | A class of things that have common characteristics and that can be divided into smaller categories

brackish | Water occurring in a natural environment having more salinity than freshwater, but not as much as seawater

FROM "LONGEST SNAKE IN NORTH AMERICA ..."

apex predators | Also known as a top predator, an apex predator is at the top of the food chain and does not have natural predators above it

PALEONTOLOGY

Alabama Paleontologist Helps Discover New 40 Million-Year-Old Shark Species

BY DENNIS PILLION | *AL.com* | December 27, 2021

Alabama paleontologist Jun Ebersole has done it again.

Ebersole is one of two researchers credited with the discovery of a new species of shark that lived roughly 40 million years ago, based on unique teeth found at a quarry in Louisiana.

Ebersole, collections director at the McWane Science Center in Birmingham, said he's published papers in scientific journals describing more than 12 new species previously unknown to science, mostly based on fossils found in and around Alabama.

That includes the Bryant shark, the Mancin shark, a duck-billed dinosaur called eotrachodon, as well as other sharks, bony fishes, stingrays and turtles.

The latest discovery, called the Carcharhinus tingae, is in the same genus as the modern bull sharks and dusky sharks, but its teeth were most similar to the requiem shark or the grey reef shark.

Ebersole and co-author David Cicimurri — curator of natural history at the South Carolina State Museum in Columbia, S.C. — were examining the collections at the Museum of Natural Science at Louisiana State University, Baton Rouge, working on a book chapter about the fossil sharks and fishes of Louisiana when they discovered teeth that didn't match any known species of fossil or modern shark.

Ebersole and Cicimurri then spent months comparing the new teeth to hundreds of other fossil and modern shark species to demonstrate that these teeth came from a previously unknown species.

The results of their study were published last week in the journal Cainozoic Research.

The newly discovered shark was named for Suyin Ting, who recently retired as curator at the LSU museum where the teeth were found.

Ebersole said the Tingae shark and the Mancin shark represent two of the oldest members of the genus Carcharhinus ever discovered.

"It's kind of really strongly suggesting that the genus Carcharhinus originated here in the Gulf of Mexico," Ebersole said. "They're global now, you find them in just about every major seaway, but it looks like they may have originated here, just because we seem to have the oldest ones."

For the most part, these ancient sharks leave only their teeth behind for researchers to discover millions of years later. But those teeth can tell us a lot. By comparing the teeth to modern sharks, researchers can determine the jaw positions of the teeth and reconstruct a shark's jaw to estimate its size.

The teeth can also indicate what kinds of prey the shark would have eaten and what modern shark is its closest living relative.

Ebersole continues studying ancient shark teeth and other fossils to discover new species in Alabama. He is working on a book about the state's fossil shark teeth showing why Alabama is one of the best places in the world to study ancient sharks, and to document the evolution of megalodon, the largest known shark species.

Jun Ebersole (above), director of collections at the McWane Science Center, examines the teeth of the Bryant shark.

(below) Teeth from the *Carcharinus tingae*, a new species of shark discovered by researchers at Alabama's McWane Science Center and the South Caroline State Museum.

Images from the McWane Science Center

The Tingae shark is from a time called the Eocene epoch, when the climate was much warmer and sea levels higher, meaning large parts of the Southeast were underwater.

Ebersole said one unusual thing about the Tingae shark is that its teeth were found in abundance in Louisiana, but that he hasn't seen one collected in Alabama. That might give a hint that for some reason, conditions at the time were different in different parts of the Gulf of Mexico.

"It's strange for me to see species like this where I don't have a single tooth of this in Alabama," Ebersole said. "Maybe this turns out to be more of a deep water shark where most of the Gulf over here was shallow.

"Maybe there was a big river that came into that particular place at that time, which this shark might have liked, a more nutrient-rich, more brackish environment, which we may not have had here in Alabama. We just don't know." ●

Edited for space

SCIENCE

11 Ways Alabamians Changed the World

BY KELLY KAZEK | *AL.com* | January 13, 2019

Although not everyone on this list changed the world in big ways, each person made a contribution to society that made a difference in the way we live, work and play. And each has a connection to Alabama.

Take a look at the things we wouldn't have if not for creative Alabamians:

Wikipedia

Jimmy "Jimbo" Wales, born in Huntsville in 1966, attended Auburn University and later the University of Alabama. He had an idea for knowledge-sharing that went on to become the largest online encyclopedia: Wikipedia.

Wales is co-founder with Larry Sanger of Wikipedia, a free online reference source created by the public. It launched in January 2001. In 2006, Wales was named on of Time Magazine's "100 Most Influential People in the World."

Americans on the moon

In Huntsville, known as "The Rocket City," a Saturn V rocket is a common sight at the U.S. Space and Rocket Center. It is the rocket that sent the first Americans to the moon on July 20, 1969, and it was largely designed and built at Marshall Space Flight Center in Huntsville.

Each of the 13 Apollo missions between 1967 and 1973 used Saturn V rockets. During the final the three Apollo missions, astronauts used the lunar roving vehicle, also design at Marshall Space Flight Center, to explore the surface of the moon.

Portable hearing aids

Miller Reese Hutchison also invented the first portable electric hearing aids. His initial bulky devices resembling the receiver of a telephone were marketed as Akouphones and Microtelephones, according to a 1901 issue of the Phrenological Journal and Science of Health.

One of his customers, Alexandra of Denmark, was so pleased with his invention that she invited Hutchison to her husband's coronation in 1902 when he became King Edward VII of England, according to a 1925 issue of Time magazine.

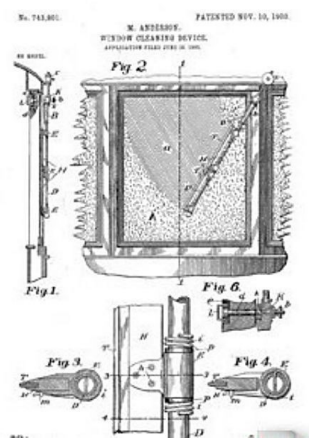
Vinyl to make records, and some other important things

Waldo Semon (1898-1999) of Demopolis, Ala., was a chemist who invented dozens of synthetic compounds, including a type of synthetic rubber bubble gum that was never marketed. But his best known inventions are vinyl - yep, that stuff used to make albums of yore - and plasticized PVC, two items commonly used today.

Windshield wipers

Although they were never successfully marketed, the first windshield wipers were invented by an Alabama woman named Mary Anderson in 1903.

Anderson (1866-1953) was on a trip to New York City when she noticed streetcar drivers opening the windows of their cars to see when it rained or snowed. Anderson invented a device with a rubber blade that could be operated with a lever by the driver. Because some people thought the device would be a distraction, Anderson never made any money from the invention. However, by 1916 windshield wipers were standard equipment on most automobiles.



Patent drawing of the **first windshield wipers** invented by an Alabama woman, Mary Anderson (above) in 1903. Anderson was on a trip to New York City when she noticed streetcar drivers opening the windows of their cars when it snowed. She went home to Birmingham, AL and invented the first fan-type windshield wiper that was turned by hand.

Airbags

George F. Kirchoff (born 1932) of Montrose is known as the "father of the airbag," which have saved countless lives since their introduction in 1987. Kirchoff, who graduated from Auburn University, was part of a team that invented the safety feature, according to a previous AL.com article.

For 35 years, Kirchoff led efforts to create the airbag while working at Thiokol Inc., Morton International and Autoliv Inc. before they became standard equipment.

Hydrocopter for ocean rescue, salvage

James W. Justus of Birmingham, working through the Deep Sea Salvage Corp., had numerous patents on ocean rescue and salvage vessels. Following the loss of 21 men in a submarine off Hawaii in 1915, Justus had the idea to invent a diving bell specifically made to rescue crews from subs. He made several versions of the diving bell throughout World War II. In 1954, Justus developed a salvage machine called the "hydrocopter" to allow divers to search for treasures from old ship wrecks. ●

Edited for space and clarity

MATHEMATICS

Sudoku

#197 PUZZLE NO. 269579

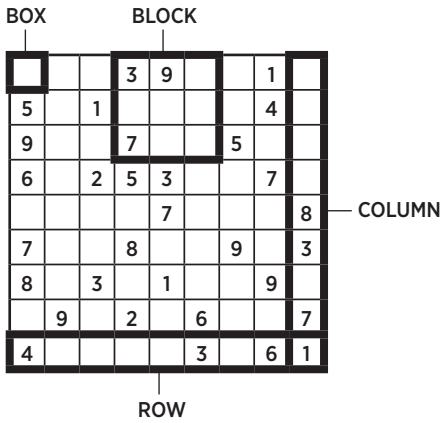
				3		4		
				9	4	7		
							6	
			3			8		
6			1					
2						6	5	7
		5	2					
	3			6			1	4
	8	4	9				2	

#198 PUZZLE NO. 9770410

		8	3	2		4		
				6				8
	9	4	8	7				
					3			
	7							9
		1	4		5		3	
	1						2	
		5		3		1	7	
		2				9	5	

SUDOKU HOW-TO GUIDE

1. Each block, row, and column must contain the numbers 1–9.
2. Sudoku is a game of logic and reasoning, so you should not need to guess.
3. Don't repeat numbers within each block, row, or column.
4. Use the process of elimination to figure out the correct placement of numbers in each box.
5. The answers appear on the last page of this newsletter.



What the example will look like solved

2	4	8	3	9	5	7	1	6
5	7	1	6	2	8	3	4	9
9	3	6	7	4	1	5	8	2
6	8	2	5	3	9	1	7	4
3	5	9	1	7	4	6	2	8
7	1	4	8	6	2	9	5	3
8	6	3	4	1	7	2	9	5
1	9	5	2	8	6	4	3	7
4	2	7	9	5	3	8	6	1

"Anything will give up its secrets if you love it enough. Not only have I found that when I talk to the little flower or to the little peanut they will give up their secrets, but I have found that when I silently commune with people, they give up their secrets also — if you love them enough."

GEORGE WASHINGTON CARVER //
African American botanist and inventor

Icons from the Noun Project

DID YOU KNOW?

In 1902 Dr. Luther Leonidas Hill performed the **first open heart surgery** in the Western Hemisphere by suturing a stab wound in a young boy's heart. The surgery occurred in Montgomery.

Alabama resident Sequoyah devised the phonetic, written alphabet of the **Cherokee language**.

Alabama is the only state with all major natural resources needed to make **iron and steel**. It is also the largest supplier of cast-iron and steel pipe products.

Peter Bryce is recognized as the **state's first psychiatrist**. He was born in 1834 and died in 1892.

To help fund education, Alabama instituted its state sales tax in 1937.

Source: www.50states.com/facts

Idiom

"Once in a Blue Moon"

Meaning Very occasionally or impossibility

Origin A long trail of research traces back to American astronomer named James Pruett. Since 1819, *The Maine Farmers' Almanac* has listed the dates of forthcoming blue moons. The compilers of the almanac had their own definition of what blue moons are. This derives from the fact that lunar and calendar months aren't quite the same and that some years have 13 full moons. In a typical 12-moon year, the moons all have names, like the familiar 'Harvest Moon', 'Hunter's Moon' etc. In a 13-moon year the extra moon is, somewhat arbitrarily, deemed to be the third moon in the season that has four rather than the usual three, and is called the 'Blue Moon'. The aforementioned James Pruett read an edition of the *Maine Farmers' Almanac*, but misinterpreted the system and printed the 'second full moon in a month' version in a 1946 edition of the *Sky & Telescope Magazine*. For some reason, probably because it ended up being printed as an answer in an early version of Trivial Pursuit, Pruett's version has gained currency. Two full moons in a month isn't really all that rare an occurrence - it happens approximately every three years.

Source: www.phrases.org.uk/meanings/once-in-a-blue-moon.html

"I love playing around with ideas and turning them into something useful or fun."

DR. LONNIE JOHNSON // Aerospace engineer and entrepreneur, inventor of the Super Soaker

HUNTSVILLE IS KNOWN AS THE **ROCKET CAPITAL** OF THE WORLD.

THE WORLD'S FIRST **ELECTRIC TROLLEY** WAS INTRODUCED IN MONTGOMERY IN 1886.

Photo of Dr. Johnson from AL.com/File Photo

ART + CULTURE

Relativity

BY SARAH HOWE | FOR STEPHEN HAWKING

When we wake up brushed by panic in the dark
our pupils grope for the shape of things we know.

Photons loosed from slits like greyhounds at the track
reveal light's doubleness in their cast shadows

that stripe a dimmed lab's wall—particles no more—
and with a wave bid all certainties goodbye.

For what's sure in a universe that dopplers
away like a siren's midnight cry? They say

a flash seen from on and off a hurtling train
will explain why time dilates like a perfect

afternoon; predicts black holes where parallel lines
will meet, whose stark horizon even starlight,

bent in its tracks, can't resist. If we can think
this far, might not our eyes adjust to the dark?

Sarah Howe is a British poet, academic and editor. Her first book, *Loop of Jade*, won the T.S. Eliot Prize and the Sunday Times/PDF Young Writer of the Year Award: it was shortlisted for the Seamus Heaney Centre Poetry Prize and the Forward Prize for the Best First Collection. Born in Hong Kong in 1983 to an English father and Chinese mother, she moved to England as a child. Her pamphlet, *A Certain Chinese Encyclopedia*, won an Eric Gregory Award from the Society of Authors.

WRITING PROMPT

Sarah Howe's poem, *Relativity*, was a sonnet written for physicist Stephen Hawking. Her inspiration came from his book *A Brief History in Time*, which was written about the study of the universe. Think about a time when something scientific inspired your creativity and use this inspiration to write a poem, short story, or creative non-fiction essay.

Word Search

A	P	P	L	A	U	S	E	S	A	E	T	N	A
C	O	L	R	E	R	U	T	C	E	L	D	I	M
E	M	A	M	C	C	I	I	S	F	E	A	E	M
A	I	M	T	I	E	L	S	U	E	G	A	N	U
A	F	I	G	U	R	E	S	O	C	S	E	A	R
S	O	Y	E	U	N	A	M	O	U	L	L	M	S
T	U	N	R	U	E	T	L	R	E	D	N	Y	R
R	S	R	A	T	S	U	E	A	L	U	U	S	N
O	M	R	E	S	M	P	R	I	R	V	T	T	S
N	I	E	T	N	S	N	T	M	E	R	S	I	S
O	L	M	S	E	E	I	E	A	E	R	S	C	I
M	M	U	E	D	I	V	I	D	D	M	T	A	T
E	R	M	E	D	I	A	G	R	A	M	S	L	E
R	E	L	A	U	A	D	S	S	U	Y	S	M	M

LECTURE
FIGURES
COLUMNS
DIVIDE
ASTRONOMER
APPLAUSE
MYSTICAL
DIAGRAMS
MEASURE
LEARNED
STARS

SCIENCE

Longest Snake in North America Found Breeding in Alabama for First Time Since 1954

BY DENNIS PILLION | *AL.com* | January 22, 2020

For the first time since 1954, biologists found evidence that the federally protected eastern indigo snake is breeding on its own in Alabama.

A collection of government agencies and universities have been trying to reintroduce the indigo snake for years in the Conecuh National Forest in south Alabama, and a young, 27-inch snake captured last week appears to be the offspring of the reintroduced apex predator.

"We're releasing these snakes that are all generally about two years old, with the hope, and the expectation that eventually the snakes will survive from year to year and breed in the wild," said Jim Godwin, a biologist with the Alabama Natural Heritage Program at Auburn University, who is leading the indigo restoration efforts in Alabama.

"It's very exciting for us to find this young snake that confirms one measure of success that we've been after all along."

The indigo snake reintroduction program is part of an attempt to restore Alabama's longleaf pine forest ecosystem, where the indigo snake serves as the top predator. It is not venomous, and literally eats copperheads and rattlesnakes for breakfast.

The eastern indigo snake is the longest snake native to North America, reaching lengths of up to nine feet, though more typically maxing out at around seven feet long.

While missing from Alabama since the 1950s, the indigo snake is still hanging on in Florida and south Georgia. Now, for the first time in seven decades, the eastern indigo is reproducing on its own in Alabama.

Over decades, the combination of habitat loss, collection for the pet trade and "gassing" in rattlesnake rodeos put the species on the brink of extinction. The indigo earned a listing as threatened under the Endangered Species Act.

"The snake was a part of Alabama," Godwin said. "Not well known, but a part of Alabama and southern Alabama. And as the importance of the longleaf pine ecosystem has really come out in the last couple of decades, we've been missing pieces of that, restoring that ecosystem."

Longleaf pine forests, which once covered much of the Southeast, have been reduced to about 3 percent of their historic range. The remaining longleaf forests are mostly in isolated clusters like Conecuh National Forest.

This young eastern indigo snake, found in the Conecuh National Forest in south Alabama in January 2020, is the first native indigo snake captured in Alabama since the 1950s. It is believed to be the offspring of snakes reintroduced into the forest over the past several years.

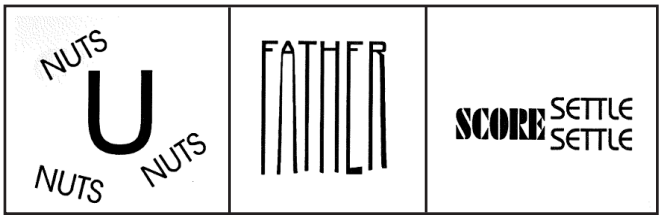
Photo courtesy Jim Godwin, Auburn University

Godwin said the efforts to reintroduce the snake are in their 14th year, with more than 160 snakes released into the wild since 2010. All snakes released are about two years old and carry unique tags so that researchers can identify the snakes if they're recaptured.

The snake captured this month was estimated to be about seven to eight months old and did not carry a tag. Godwin said he did not want to provide additional details about the snake's location because there are still concerns about poaching.

Godwin said the snake was discovered by a research team from Auburn investigating gopher tortoise burrows in the National Forest. Indigo snakes are closely associated with gopher tortoise burrows in Alabama, especially in the winter. Godwin said the snakes will take shelter in the burrows on cold days, and roam about looking to reproduce on warm, sunny days during the winter. ●

WORD PLAY A Rebus puzzle is a picture representation of a common word or phrase. How the letters/images appear within each box will give you clues to the answer! For example, if you saw the letters "LOOK ULEAP," you could guess that the phrase is "Look before you leap." *Answers are on the last page!*



FEATURE

The James Webb Space Telescope, with Ties to North Alabama, has Successfully Launched

BY ASHLEY STRICKLAND | *WAAY 31* | December 25, 2021

It's a moment that has been decades in the making. The James Webb Space Telescope, NASA's premier space observatory of the next decade, successfully launched on Christmas morning.

The telescope lifted off atop an Ariane 5 rocket from Europe's Spaceport in French Guiana at 7:20 a.m. ET.

The Webb telescope has endured years of delays, including a combination of factors brought on by the pandemic and technical challenges. But the world's most powerful and complex space observatory will answer questions about our solar system, study exoplanets in new ways and look deeper into the universe than we've ever been able to.

The European Space Agency aptly referred to it as "an awesome Christmas present" for the international launch teams, as well as the whole of space science, on Twitter.

NASA Administrator Bill Nelson shared his gratitude for the international teams that made the mission and the Christmas Day launch possible.

"This is a great day for planet Earth," Nelson said shortly after the launch. "Thanks to the team. You all have just been incredible. Over three decades, you produced this telescope that is now going to take us back to the very beginnings of the universe. We are going to discover incredible things that we never imagined."

Webb will peer into the very atmospheres of exoplanets, some of which are potentially habitable, and it could uncover clues in the ongoing search for life outside of Earth.

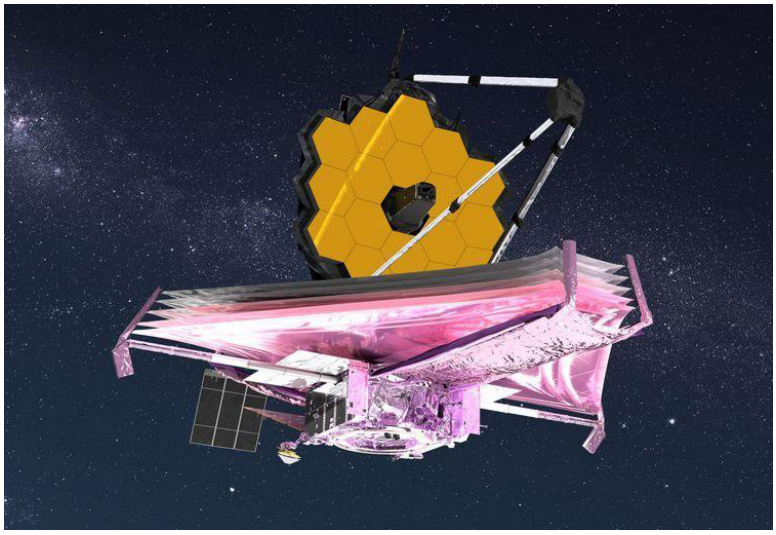
The telescope comes equipped with a mirror that can extend 21 feet and 4 inches (6.5 meters) — a massive length that will allow the mirror to collect more light from the objects it observes once the telescope is in space. The more light the mirror can collect, the more details the telescope can observe.

The mirror includes 18 hexagonal gold-coated segments, each 4.3 feet (1.32 meters) in diameter.

It's the largest mirror NASA has ever built, the agency said, but its size created a unique problem. The mirror was so large that it couldn't fit inside a rocket. So the NASA team designed the telescope as a series of moving parts that can fold origami-style and fit inside a 16-foot (5-meter) space for launch.

Webb will act as an infrared detective, detecting light that is invisible to us and revealing otherwise hidden regions of space, according to NASA.

Since 2004, thousands of scientists, technicians and engineers from 14 countries have spent 40 million hours building the telescope. The telescope includes instruments from the Canadian Space Agency and the European Space Agency.



Artist rendering of the James Webb Space Telescope

Image by NASA GSFC/CIL/Adriana Manrique Gutierrez

Now, Webb is ready to help us understand the origins of the universe and begin to answer key questions about our existence, such as where we came from and if we're alone in the cosmos.

What Webb will see

The Webb telescope will look at every phase of cosmic history, including the first glows after the big bang that created our universe and the formation of the galaxies, stars and planets that fill it today. Its capabilities will enable the observatory to answer questions about our own solar system and investigate faint signals from the first galaxies formed 13.5 billion years ago.

The telescope will take a closer look at a selection of exoplanets to peer inside their atmospheres, if they have them, and help answer questions about how the planets formed and evolved. Data collected by the telescope can tell scientists if methane, carbon dioxide or carbon monoxide is in the atmosphere. The gases within these alien atmospheres could reveal the very building blocks of life.

Other objects of interest for the initial science

"Know more and you will fear less."

LYNIKA STROZIER // American researcher and scientist

campaign include observing the supermassive black hole at the center of the Milky Way, actively forming planetary systems, bright quasars at the center of galaxies, and leftovers from the formation of our solar system known as Kuiper Belt Objects.

What it can do

With all of its superlatives, engineering Webb was an extraordinary challenge. The observatory is comprised of three main elements.

One is the Integrated Science Instrument Module, which holds Webb's suite of four instruments. These instruments will mainly be used for capturing images or spectroscopy — breaking down light into different wavelengths to determine physical and chemical components.

The main eye of the observatory, called the Optical Telescope Element, includes the mirrors and backplane, or spine, that supports the mirrors. And then there's the Spacecraft Element, which includes the spacecraft bus and sunshield

The spacecraft bus includes the six main subsystems needed to operate the spacecraft, including propulsion, electrical power, communication, data and thermal controls. This "bus" design, which doesn't actually resemble a bus, is used to support the spacecraft's infrastructure.

The five-layer sunshield unfurls to reach the size of a tennis court and it will protect Webb's giant mirror and instruments from the sun's heat — because they need to be kept at a very frigid negative 370 degrees Fahrenheit (negative 188 degrees Celsius) to operate.

When to expect the first images

The observatory will travel for about a month until it reaches an orbit about 1 million miles (1.6 million kilometers) away from Earth. During those 29 days, Webb will unfold its mirrors and unfurl the sunshield. This process involves thousands of parts that must work perfectly in the right sequence.

Fortunately, each step can be controlled from the ground in case there are issues.

And then it will go through a period of commissioning in space that lasts for six months. That includes cooling down the instruments, alignment and calibration. All of the instruments will go through a checkout process to see how they're functioning.

"The launch of the Webb Space Telescope is a pivotal moment — this is just the beginning for the Webb mission," said Gregory L. Robinson, Webb's program director at NASA Headquarters, in a statement.

"Now we will watch Webb's highly anticipated and critical 29 days on the edge. When the spacecraft unfurls in space, Webb will undergo the most difficult and complex deployment sequence ever attempted in space. Once commissioning is complete, we will see awe-inspiring images that will capture our imagination."

Webb will begin to collect data and its first images later in 2022. Thousands of scientists have been waiting for years to see what the observatory can show us.

"The initial year of Webb's observations will provide the first opportunity for a diverse range of scientists around the world to observe particular targets with NASA's next great space observatory," said Thomas Zurbuchen, associate administrator for the Science Mission Directorate at NASA, in a statement.

"The amazing science that will be shared with the global community will be audacious and profound." •

Edited for clarity

RANDOM-NEST

Scientist | Fossils Reveal Alabama Most Biodiverse State in the Country

BY DENNIS WASHINGTON | *ALABAMA NEWS CENTER* | FEBRUARY 20, 2020

New research has found that Alabama has more plant and animal species, both living and dead, than any other state in the nation.

Jun Ebersole, an archaeologist and paleontologist at the McWane Science Center, shared his latest findings Feb. 19 at Dauphin Island Sea Lab. Ebersole is creating a fossil inventory of the state, concentrating on vertebrates — things with backbones, such as sharks, dinosaurs and bony fish. He's cataloged more than 300 species in Alabama, easily surpassing South Carolina and Florida, two states historically considered to be the most paleobiodiverse states in the country.

"I've tripled what was considered the No. 1 state in the U.S. in terms of paleobiodiversity, and that's just with sharks and bony fish," Ebersole said. "We're just getting started."

Ebersole's research has also helped him and other scientists catalog Alabama's diversity of living species. A 2002 report by The Nature Conservancy ranked Alabama No. 5 behind California, Texas, Arizona and New Mexico, but Ebersole said deliberate research in recent years to catalog Alabama's plant and animal species proves Alabama is the most biodiverse state.

"I moved here because of the unbelievable amount of stuff we have here," Ebersole said. "That's why I can stand here with confidence and tell you we are No. 1, and No. 1 by far."

Ebersole said Alabama's large amount of freshwater lakes and rivers is the main reason for the state's biodiversity and paleobiodiversity superiority.

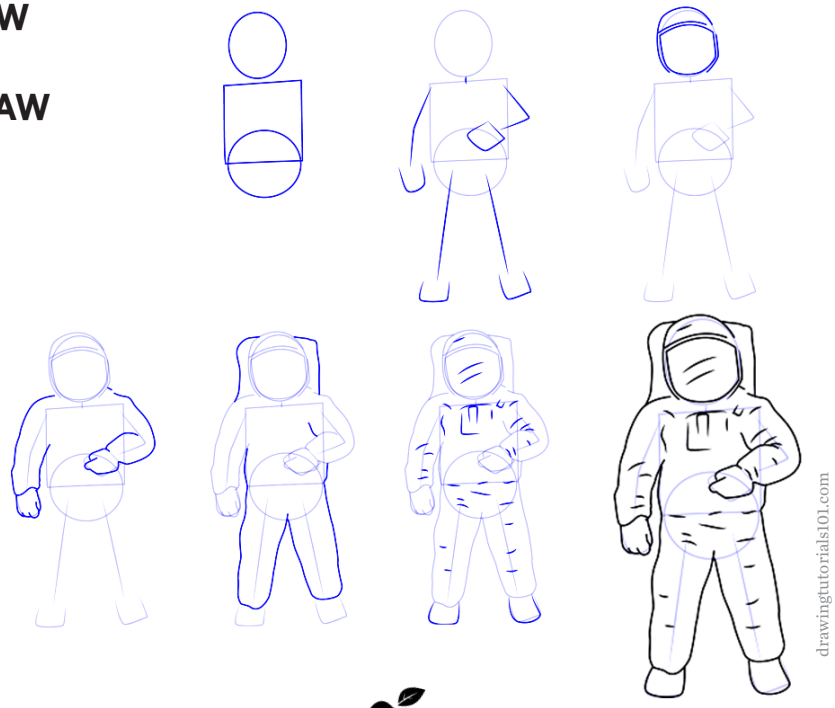
"We have 132,000 miles of inland waterways, which is No. 1 in the country," Ebersole said. "60% of aquatic biota in North America is in the Tennessee Valley. Anything aquatic, we're going to rank No. 1 in that in the U.S."

Ebersole said Alabama's latitude on the planet and proximity to coastal waters has helped make the state one of the most unique places in North America in terms of surface geology.

"If you want to study the history of life in chronological order, there's not a better place in North America than Alabama," Ebersole said. "We have five geologic ecoregions in Alabama, and you can see all five of these regions by just driving I-65. Having five in one state is very unique."

Edited for space

HOW TO DRAW ...



WORDS OF ENCOURAGEMENT

Much of the world we know today is based on incredible scientific discoveries — electricity, running water, automobiles, technology. The list goes on and on. Often, we regard the people behind these inventions as being geniuses and having abilities beyond that of the average person. However, many well-known scientists in history credit their discoveries not to their amount of education but to their imaginations and what they observed in the world.

A good example of this is the well-known folklore of how Isaac Newton discovered gravity. As the story goes, Isaac Newton was leaning against the trunk of an apple tree when suddenly one of the large red fruits fell and hit him on the head. This sparked an "aha moment" for Newton that led to his theory of gravity, which is the basis of modern physics. This is not an accurate account of how Newton developed his theory of gravity. In reality, Newton had to leave Cambridge University following the breakout of the bubonic plague. During his time back on the farm, Newton witnessed an apple drop from a tree and wondered to himself why it fell straight down rather than up or sideways. The real story highlights the importance of perseverance and creativity even more than the story more commonly shared. As we now know, things fall in a linear path towards earth because of the gravity exerted on them. However if Newton had never asked himself this simple question, we might still be wondering how gravity works.

The person who is responsible for the theory of relativity, Albert Einstein, once said, "Imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world." Even one of the most highly regarded physicists in history recognized that without a creative mind, intelligence is nothing. Remember to always look at the world around you with creativity. Never quit observing, asking questions, and dreaming about what could be. We hope you have enjoyed this edition of *The Warbler*.

Katie and the APAEP Team

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"International collaboration is essential for solutions to global climate change and sustainable development goals."

DR. HANQIN TIAN // Director, International Center for Climate and Global Change Research at Auburn University

Answers

SUDOKU #197

8	7	6	5	3	1	4	9	2
3	2	1	6	9	4	7	8	5
4	5	9	8	7	2	1	6	3
5	9	7	3	2	6	8	4	1
6	4	8	1	5	7	2	3	9
2	1	3	4	8	9	6	5	7
1	6	5	2	4	3	9	7	8
9	3	2	7	6	8	5	1	4
7	8	4	9	1	5	3	2	6

SUDOKU #198

6	5	8	3	2	9	4	1	7
1	3	7	5	6	4	2	9	8
2	9	4	8	7	1	3	6	5
5	2	9	7	8	3	6	4	1
4	7	3	6	1	2	5	8	9
8	6	1	4	9	5	7	3	2
3	1	6	9	5	7	8	2	4
9	4	5	2	3	8	1	7	6
7	8	2	1	4	6	9	5	3

Rebus Puzzle

Page 3

1. Nuts about you
2. Daddy long legs
3. A score to settle

Send ideas and comments to:

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UNTIL NEXT TIME !